

**CONCORDANCE OF ADOLESCENT REPORTS OF FRIEND PROBLEM
BEHAVIORS AS PREDICTED BY QUALITY OF RELATIONSHIP AND
DEMOGRAPHIC VARIABLES**

by

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Adolescent alcohol use is strongly associated with many negative health outcomes and can increase risk for drinking problems later in life. The strongest predictor of adolescent alcohol use is affiliation with friends who also drink, use other drugs, or exhibit other problem behaviors (e.g., stealing, fighting). Currently, many studies examine friend problem behavior by asking adolescents to provide reports of their friends' behaviors; however, some research suggests that these reports may be inaccurate. While it is difficult to determine accuracy of report, report concordance is easily measured. No studies have examined variables that might predict report concordance, such as characteristics of the relationship (e.g. relationship quality; time spent with friends). This study compared adolescents' perceptions of their close friend's smoking, drinking, and deviant behavior to self-reports collected directly from the friends. Degree of association between perception and friend report was studied as a function of several relationship characteristics and demographic variables (e.g. age, gender) hypothesized to predict concordance. Results indicated that the statistically significant concordance between adolescent perception and friend self-report of smoking and drinking behavior was driven largely by agreement concerning the absence of behavior; adolescents were not sensitive in their perceptions of their friends' positive history of substance use. Concordance between adolescent perceptions and friend self-report of deviance

was statistically significant but modest in magnitude, with most targets under-reporting their friend's involvement in deviant behaviors. Few variables predicted report concordance for the three outcome variables (smoking, drinking, and deviance), and those that did (age, adolescent's own problem behavior, negative relationship quality, and amount of time spent with friends) accounted for only a small amount of the variance. Implications for the assessment of friend influence on adolescent problem behavior are discussed.

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1.0 INTRODUCTION

Although alcohol use disorders are rare in children prior to high school age ([Cohen et al., 1993](#); [Giaconia et al., 1994](#); [Sung et al., 2004](#)), alcohol use is present in childhood and throughout adolescence ([Donovan and Molina, 2008](#)). National data from the 2006 Monitoring the Future study show that 40.5% of eighth graders have used alcohol and that 19.5% have been drunk ([Johnston et al., 2006](#)). Furthermore, alcohol use increases steadily throughout adolescence and peaks in early adulthood. Data from the 2006 National Household Study on Drug Use and Health (NHSDUH) demonstrate that binge drinking peaks at age 21, with 49.3% of respondents reporting consuming five or more drinks on the same occasion at least once in the past month ([Office of Applied Studies, 2007](#)).

Some alcohol use in adolescence is normative ([Moffitt, 1993](#)). It is, however, associated with a number of other health risk behaviors such as smoking, drug use, and sexual behavior ([Donovan and Jessor, 1985](#); [Kulbok and Cox, 2002](#); [Valois et al., 1999](#)), and can also increase the risk of physical and sexual assault, motor vehicle crashes, school dropout, pregnancy, and sexually transmitted diseases ([Bachanas et al., 2002](#); [Bonomo et al., 2001](#); [Lang et al., 1996](#); [Meropol et al., 1995](#)). Early alcohol use (e.g. having a full drink before the age of 15) also predicts the likelihood of alcohol problems later in life, including adolescent problem drinking ([Gruber et al., 1996](#);

[Hawkins et al., 1997](#); [Hingson et al., 2008](#); [Pedersen and Skrondal, 1998](#)) and adult alcohol use disorders ([DeWit et al., 2000](#); [Grant and Dawson, 1997](#)).

Children who begin drinking at an atypically young age are also more likely to use and abuse illicit drugs than children who begin drinking later. For example, in a large epidemiological sample, Hingson and colleagues ([2008](#)) found that 47% of adults who recalled drinking before age 15 reported a lifetime history of illicit drug use in contrast to 19% of adults who recalled first drinking at age 18 and 10% of adults who recalled first drinking after age 20. Further, adults who recalled first drinking prior to the age of 14 were three times more likely to have a lifetime history of drug dependency than adults who started drinking after age 20 ([Hingson et al., 2008](#)). Therefore, while some alcohol use in adolescence is normative, alcohol use before age 15 may indicate a pathway to continued problem behavior.

Friends play an important role in socializing minors into alcohol use. In adolescence, when teenagers begin to experiment with alcohol, friends have a greater influence on behavior than in earlier developmental stages ([Conger and Rueter, 1996](#); [Jessor and Jessor, 1977](#)). Friends can play a role in the development of adolescent alcohol and other substance use by modeling behavior; shaping norms, attitudes, and values; and providing opportunities for use ([Ennett and Bauman, 1991](#); [Graham et al., 1991](#); [Kandel, 1985](#); [Kandel and Andrews, 1987](#)). These friend influence processes also apply to other problem behaviors (e.g. rule breaking and lying). Furthermore, various problem behaviors commonly co-occur ([Donovan and Jessor, 1985](#); [Jessor and Jessor, 1977](#)), and friend influence (i.e., the role of friends in the development of problem behaviors) and friend affiliation (i.e., the tendency for adolescents who engage in problem behaviors to associate with friends who also engage in problem behaviors) are both important components of the development of maladaptive behaviors in adolescence. In sum, researchers

have found that socializing with certain types of friends, particularly those who use substances, are risk factors for a variety of problem behaviors including alcohol use, non-alcohol substance use, and deviant behavior.

Sher's deviance proneness model ([1991](#)) proposes mechanisms for the development of problem behaviors, and ultimately problem drinking, in adolescents at risk due to a family history of alcoholism. Children of alcoholics are more likely to have difficult temperaments, executive functioning deficits, and other cognitive deficits, which can contribute to difficulties with self-regulation ([Sher, 1991](#)). This constellation of factors also contributes to difficulties in school ([Patterson, 1986](#)) and with the formation of prosocial friendships. Beyond difficulties in school, social deficits can also result in affiliation with deviant friends ([Dishion et al., 1991](#)), which increases opportunities and models for problem behaviors that include alcohol and drug use ([Chassin et al., 2004](#); [Dishion et al., 1995a](#); [Sher, 1991](#)). Substance use by friends in close friendships and peer groups inside and outside of school contributes uniquely to adolescent substance use, indicating the importance of friend effects in various social settings ([Hussong, 2002](#)).

1.1 FRIEND RISK FOR ALCOHOL AND OTHER SUBSTANCE USE

There is a robust literature supporting the role of friends in the onset and development of alcohol and other substance use in adolescence. For example, a strong predictor of adolescent substance use is having a best friend who smokes or drinks ([Ennett and Bauman, 1994](#)). Indeed, Leatherdale and colleagues ([2006](#)) found that for every friend who smokes, the likelihood of a

child smoking is increased by 3.16. This friend effect on adolescent smoking is greater than the influence of mothers, fathers or older siblings who smoke. Further, it is well documented that adolescents who associate with deviant friends are at increased risk for substance use ([Ary et al., 1999](#); [Ary et al., 1993](#); [Barrera et al., 2001](#); [Dishion et al., 1995b](#); [Fergusson et al., 2002](#); [Petraitis et al., 1995](#)). Therefore, having friends who either use or tolerate substances ([Hawkins et al., 1992](#)) or who exhibit deviant behaviors is a risk factor for the development of adolescent substance use. Further, Curran and colleagues ([1997](#)) found that friend alcohol use predicted increases in adolescent alcohol use at three annual assessments. Thus, friend behaviors exert influences on both the initiation of drinking behavior and future escalation of drinking in adolescents. Moreover, friend influence on adolescent alcohol use has been quantified by Jessor and Jessor ([1977](#)). In a model that accounts for 34% of the variance in drinking onset in boys and 10% of the variance of drinking onset in girls, adolescents whose friends had greater influence and who had more friends as models for problem behavior were more likely to initiate drinking ([Jessor and Jessor, 1977](#)). In sum, affiliation with deviant friends accounts for a significant proportion of the variance in adolescent alcohol use and it is therefore important to evaluate friend problem behaviors when assessing adolescent alcohol and other substance use.

1.2 FRIEND RISK FOR DEVIANCE

As suggested by prior theoretical models of problem behavior ([Jessor and Jessor, 1977](#)) and alcohol use ([Sher, 1991](#)), affiliation with deviant friends is not only a significant risk factor for adolescent substance use, it is also an important predictor of adolescent deviance, including both

property and violent crime ([Farrington, 1995](#); [Fergusson and Horwood, 1996](#); [Fergusson et al., 2002](#); [Hoge et al., 1994](#); [Moffitt, 1993](#); [Woodward et al., 2002](#)). One study found that the relation between friend deviance and adolescent deviance was so strong that it remained highly significant after controlling for adverse life events, unemployment, age of leaving school and leaving home ([Fergusson et al., 2002](#)). Additionally, affiliation with deviant friends not only increases the likelihood of an adolescent engaging in problem behaviors, but it also serves to intensify existing antisocial behavior ([Patterson et al., 2000](#)). While association with deviant friends is a risk factor for all age groups, deviant friends may have a greater influence on younger, compared to older children. For example, Fergusson and colleagues ([2002](#)) found that friends exerted the greatest influence on participants who were 14 to 15 years of age in a sample of children ranging in age from 14 to 21. Using a developmental framework, researchers have shown that friend influence decreases with age and that partners play an increasing role in young adult behavior, modifying and supplanting friend influences ([Woodward et al., 2002](#)). Therefore, because friends exert such a strong influence during adolescence, this may be an important developmental period for understanding the relation between friend influence and adolescent problem behavior.

A methodological issue that has attracted considerable research attention in the substance use literature with regard to friend influence is the reporting source. This has become relevant because the vast majority of studies of friend influence rely on the perception of friend use by the research participant ([Chassin et al., 2004](#)). Research has shown that adolescents who themselves use substances tend to overestimate the substance use of their friends ([Bauman and Koch, 1983](#)). However, research has also shown that the perception of friend substance use by an adolescent may be a stronger predictor of adolescent substance use than the friends' actual behavior

([Bauman and Fisher, 1986](#); [Iannotti et al., 1996](#)). Thus, the perception of friend behavior, even if inaccurate, may contribute importantly to the development of alcohol and drug use among teens. Very little research, however, has specifically addressed variables that might affect the accuracy of adolescent perceptions of friend behavior. Although assessment of accuracy per se is difficult because it depends on the veracity of the friend's self-report, assessment of concordance of adolescents' reports of one another's behaviors should be a feasible approximation of accuracy. A more thorough understanding of concordance in reporting might ultimately aid prevention studies that seek to mitigate the impact of risk factors on early adolescent alcohol and drug use by focusing on those adolescents most likely to misperceive friend alcohol and substance use.

1.3 STUDIES OF ADOLESCENT REPORTING CONCORDANCE

Although the literature relies heavily on perceptions of friend behavior by research participants, only two studies have specifically examined the concordance of adolescent perceptions of friends' substance use. In a sample of 67 adolescents between the ages of 12 and 14, proband self-report and friend perceptions of proband drinking behavior and drunkenness were strongly correlated ($r = 0.67$), but friends perceived significantly higher levels of behavior than was reported by the adolescent ($t = 2.99$, 66 d.f., $p < .01$; [Smith et al., 1995](#)). However, because probands were asked to nominate a friend who was aware of their drinking habits, results may not generalize to friend relationships defined more broadly or to reporting paradigms in which the collateral reporter is selected independent of their level of knowledge of the proband's drinking behavior.

A study by Bauman and Koch ([1983](#)) used biological verification (carbon monoxide levels) to determine whether eighth graders were accurate reporters of their friends' smoking behavior. Adolescents who smoked, compared to adolescents who did not smoke, were more likely to inaccurately report that their non-smoking friend was a smoker. However, adolescents who smoked, compared to adolescents who did not smoke, were also more likely to accurately report that their smoking friend was a smoker. Thus, being an adolescent smoker amplifies the belief that adolescent friends are also smokers, regardless of their friends' actual smoking status, which contributes to false positive reporting errors.

Given the paucity of research on the accuracy of perceptions about substance use among adolescents, the literature on perceptions of other behaviors may be instructive. Two comprehensive meta-analyses examined the relation between peer- and self-reported behaviors in children. Renk & Phares ([2004](#)) examined 39 studies and found a mean correlation of 0.29 between peer perceptions and self-reports of social competence (e.g. social skills and social knowledge), which suggests that agreement is not very high among youth in their evaluations of one another in social domains. Achenbach ([1987](#)) found that across 269 samples in 119 studies, there was an average correlation of 0.26 between peer perceptions and child self-reports of behavioral and emotional problems. This association was stronger than the relation between parent and child reports of child behavior, and was the same as the relation between child and teacher or mental health worker reports about the child ([Achenbach et al., 1987](#)). Not surprisingly, reports about behavioral undercontrol (e.g., aggression, defiance, etc.) had an average correlation of 0.44, while reports of less easily observed behavioral overcontrol (e.g., anxiety, depressed mood) were less strongly correlated at 0.31 ([Achenbach et al., 1987](#)). Thus, children's reports of one another's behaviors may be more accurate for ratings of externalizing

behaviors than for ratings of internalizing behaviors. A limitation of this meta-analysis, however, is that reports provided by peers were aggregated across multiple peers (often entire classrooms), and as such did not assess the relationship within friendship dyads. Therefore, an important direction for further research is to examine how reports of behaviors within peer dyads, specifically close friendships, are correlated, especially given the greater influence of the close friendship dyad in the initiation and escalation of substance use and other problem behaviors.

Some research has been conducted examining the relation between adult self-reports and collateral perceptions of substance use. One study assessed alcohol use in adult alcoholics at baseline and at 15-month follow-up ([Babor et al., 2000](#)). Results indicated positive correlations ($r_{\text{baseline}}=0.46$ to 0.53 ; $r_{\text{follow-up}}=0.37$ to 0.63) between self- and collateral-reports on drinking measures (percent days drinking and drinks per drinking day). Although the correlations between reporters were moderate, concordant reports may have been due to the elevated level of, and potentially more observable, alcohol use in the probands. The nature of the participant's relationship with the collateral was not reported, however. Stacy and colleagues ([1985](#)) examined friends' perceptions of college student behavior and found that self- and friend- (collateral) reports of alcohol ($r = 0.72$), marijuana ($r = 0.88$), and cigarette ($r = 0.82$) use were highly correlated ($ps < 0.01$).

Other researchers have found correlations of varying magnitude among self- and collateral reports of alcohol use ($rs = 0.39$ - 0.72 ; [Curtin et al., 2001](#); [LaForge et al., 2005](#); [Marlatt et al., 1998](#)). Although these results include strong associations in some cases, alcohol use may be more observable among adults than among adolescents, permitting higher rates of concordance. Further, in these studies the nature of the relationships between the collateral

reporter and the proband varied (e.g. friend, romantic partner). Different types of relationships may be characterized by different relationship qualities and intimacy. For example, in one study, the adult collaterals had known the probands for an average of 6.5 years (CI: 5.7-7.5; [LaForge et al., 2005](#)). Concordant reports in adult relationships may also be a function of longer relationships in adulthood than in adolescence.

These findings do, however, raise the intriguing possibility that aspects of the adolescent dyad relationship might affect the concordance of reports, with the expected degree of association falling somewhere between the children's classroom average of $r=.26$ reported by Achenbach (which presumably included friends as well as non-friends) and the $r=.70$ to $.80$ range reported for adult friends. In light of the limited research on relationship features as they affect perceptions of friend behavior, specifically in regard to adolescent problem behaviors, more research is indicated.

1.4 RELATIONSHIP QUALITY AND DEMOGRAPHIC VARIABLES: EFFECTS ON CONCORDANCE BETWEEN ADOLESCENT PERCEPTIONS AND FRIEND SELF-REPORT OF BEHAVIOR

Although characteristics of dyadic relationships could be expected to predict the concordance between collateral- and self-reported behavior, little research has been conducted in this area. For example, the quality of the relationship between friends may predict the perceptions of adolescent behavior among friends. Individuals are likely to change friendships in early adolescence (see [Ennett and Bauman, 1994](#)) resulting in relationships of shorter duration and

consequently decreased familiarity which should decrease awareness of behavior within the dyad. It may be helpful to evaluate whether relationship characteristics such as length or quality of friendship relate to perceptions of friend behavior. Another aspect of relationship quality that could be of importance is the amount of time spent with friends. Presumably, more time with friends would predict greater awareness of behaviors which should increase similarity of reports.

Laforge and colleagues ([2005](#)) studied the utility of collateral reporters for assessing alcohol use in a sample of college students. They found that the amount of time that a collateral and a college student spent drinking together was related to more concordant reports of alcohol use; however, this relationship was not linear. Dyads that drank together on 2 to 5 occasions in the last month had more concordant reports of the number of drinks consumed per week than did dyads who spent either more or less time drinking together. Further, there was a negative correlation between time spent drinking together and report concordance for peak number of drinks and average drinks per day. These findings suggest that time spent drinking together is associated with report concordance. In adolescence, however, drinking behaviors are less overt and less frequent. As such, overall time spent with friends may be a useful predictor of report concordance. LaForge and colleagues also reported that relationships with more intimate contacts (e.g. romantic partner, roommate) were associated with more concordant reports, whereas relationships with less intimate contacts were associated with lower rates of report agreement and significantly lower levels of drinking reported by collaterals ([LaForge et al., 2005](#)). Taken together, these findings provide some evidence for the role of friendship characteristics in the prediction of report concordance, but they are limited to study of adults. Relationship characteristics including length of friendship, time spent with friends, and level of relationship intimacy have yet to be examined as predictors of report concordance in adolescents.

One area of research that is devoid of study is the extent to which individual characteristics such as age and gender predict perceptions of friend behavior. Several studies about consistency of self-report over time suggest that children's reporting accuracy increases with age ([Achenbach et al., 1987](#); [Johnson and Mott, 2001](#)). For example, Fendrich and Rosenbaum ([2003](#)) found that 6th graders were less likely to recant previously reported cocaine use compared to 4th and 5th graders. Increasing age is also correlated with increasing similarity of adolescent behavior within friendship dyads ([Tolson and Urberg, 1993](#)). Thus, older children may be more likely to be concordant in their perceptions of one another's behaviors, but this assumption remains untested.

No studies have tested gender as a potential predictor of reporting concordance, but research on friend influence and intimacy for boys versus girls suggests that gender may play a role. Dick and colleagues found that friend drinking, smoking, and getting into trouble were more strongly related to adolescent alcohol use for girls than for boys ([Dick et al., 2007](#)). These findings, in conjunction with greater emotional intimacy in female friendships ([Berndt, 1982](#)), may indicate greater awareness of friend behaviors in female friendships, suggesting that gender may predict concordance between adolescent perception and friend self-report of adolescent problem behavior.

Because there is little research on the factors that influence friend perceptions of adolescent problem behavior, yet research on adolescent substance use relies heavily on such perceptions, it is important not only to understand whether collateral- and self-reports of adolescent problem behavior are concordant but to determine which variables predict reporting concordance. Although there has been little research on the role of relationship quality as a predictor, it is possible that variables such as the amount of time spent with friends, length of

friendship, and level of intimacy could predict report concordance. Further, previous research suggests that demographic variables such as age and gender may play a role in reporting concordance, suggesting their utility as predictors. As such, the current study examined the following aims:

Aim 1: To determine the degree of association between self-reported and friend-perceived substance use and deviant behavior by reciprocally endorsed friends in early adolescence.

Aim 2: To examine quality of relationship (i.e. length of friendship, time spent with friends, positive and negative aspects of relationship quality) and demographic characteristics (i.e. age, gender) as potential predictors of the association between self-reported and friend-perceived substance use and deviant behaviors by reciprocally endorsed friends in early adolescence.

2.0 METHODS

Data were drawn from the ongoing Tween to Teen Study, a prospective longitudinal study of 452 children (238 girls) aimed at evaluating risk factors for early onset alcohol use. Children and their biological parents were recruited from two age cohorts. At baseline, participants in the younger cohort averaged 8.5 years of age, and participants in the older cohort averaged 10.5 years of age. Participants and one to two friends were evaluated at six-month intervals (“waves”) for a total (to date) of nine assessments (the interval between the seventh and eighth wave of the study was a year and a half due to a funding delay). This study used data from the ninth wave of this project when participants averaged 13 and 15 years of age in the younger and older cohorts, respectively. Human subjects procedures were approved by the University of Pittsburgh Institutional Review Board. A Certificate of Confidentiality was obtained from the National Institute on Alcohol Abuse and Alcoholism.

2.1 PARTICIPANT RECRUITMENT PROCEDURES

Children (“targets”) were selected for participation using targeted-age directory and random digit dialing (RDD) sampling of families in Allegheny County, Pennsylvania (population 1.3 million),

which includes the city of Pittsburgh. Directory listings were provided by Survey Sampling Inc. (Fairfield, CT) and RDD lists were provided by Genesys Sampling Systems (Ft. Washington, PA). Initial screening was carried out by the Survey Research Center of the University Center for Social and Urban Research (UCSUR) at the University of Pittsburgh. Recruitment goals included equal numbers of 8- and 10-year-old children (half of each age cohort female), and over-sampling of single-mother headed families and African-American families (Allegheny County is 13% African-American based on data from the U.S. Census; [U.S. Census Bureau, 2007](#)). Following initial telephone screening in 2001-2002, project staff confirmed eligibility and scheduled computer-assisted interviews in homes or at the research offices. After collection of parental informed consent and personal assent, computer-assisted interviews were read to the children who responded using the computer mouse.

Of the 1,155 potentially eligible families identified by UCSUR, it was not possible to recontact or screen 251 (did not return or answer our calls) and another 100 were ineligible (e.g., child was the wrong age or not a biological child, or the relevant quota had already been filled). Of the remaining 804 eligible families, 504 (63%) agreed to participate and 452 completed the Wave 1 interviews (90% of those who agreed and 56% of those eligible). Participants did not differ significantly from the other 703 families (Unable to Contacts, Ineligibles, Refusals, Non-completers) on variables collected by UCSUR in the screening interviews of mother's education ($\chi^2=9.2$, $df=6$, $p=.16$), race ($\chi^2=0.79$, $df=2$, $p=.67$), or age cohort of the target child ($\chi^2=1.7$, $df=1$, $p=.20$). Table 1 presents descriptive information for the sample at Waves 1 and 9.

Table 1. Description of the Sample of Participants

	Wave 1 (n=452) % (n)	Wave 9 (n=390) % (n)
Child Age-Cohorts by Gender		
8-year-old Boys	20% (92)	22% (84)
8-year-old Girls	26% (118)	25% (99)
10-year-old Boys	27% (122)	27% (105)
10-year-old Girls	27% (120)	26% (102)
Racial/Ethnic Background		
African-American	24% (110)	21% (80)
White	73% (331)	77% (300)
Other	2% (11)	3% (10)
Family Structure		
Mother and Husband/Partner	77% (346)	74% (290)
Single Mother	23% (106)	26% (100)
Parental Age		
Mother: Mean(SD)	39.0 (5.7)	44.5 (5.4)
Mother's Highest Education		
Some High School	4% (17)	3% (11)
Graduated High School	15% (67)	15% (58)
Vocational-Technical Training	14% (64)	13% (51)
Some College	24% (109)	24% (93)
Graduated from College	32% (146)	34% (133)
Post-graduate Education	11% (49)	11% (44)

2.2 FRIEND RECRUITMENT PROCEDURE

Friends were identified by asking the target children to name two current friends. Targets or their mothers provided contact information for the parents of the target-nominated friends. Few mothers did not know the friends or could not provide contact information (5.5% in W-1 to 2.6% in W-4). A research associate contacted the parents to confirm that the friendship was reciprocal, to introduce the purpose of the study, and, if the parent of the nominated friend orally consented, to schedule a phone interview for their child. Only reciprocally endorsed friends who were within two years of age of the target child were asked to participate. Prior to the interview, a packet of information was mailed to the family, including a consent form to be completed and returned prior to the interview date, and a paper-and-pencil form of the interview. Parents were informed that the child was not to see the paper-and-pencil form until the scheduled interview. To minimize confusion or miscommunication, friends followed the paper-and-pencil form while the research associate read the interview questions. Friends were asked to provide self-reports of their relationship with the target child, self-reported personality attributes, approval and pressure for alcohol and drug use, and involvement in alcohol use, drug use, and delinquent behavior. Because parents were encouraged to review the content of the paper-and-pencil form prior to the interview, privacy issues were raised. Although there was the potential for parents to eavesdrop on the interview, the paper-and-pencil copy had numbered answers and children were encouraged to respond using the appropriate number. Therefore, although a participant could be

reporting sensitive information, at the time of the interview the parent was unaware of the corresponding values of the numbered coding system. The greatest obstacles to obtaining friend interviews were parental failures to return telephone calls and children being unavailable for scheduled telephone interviews; numbers of friends participating at Wave 9 are detailed below.

2.3 WAVE 9 PARTICIPANTS

Three hundred and ninety targets participated in Wave 9 of the study (86.3% of the originally recruited sample). At Wave 9, at least one friend participated for 232 of these targets (59.5%); two friends participated for 93 of these targets (23.8%). Friends were labeled as Friend 1 and Friend 2 based on the order that they were identified by the target. Only one friend was used for the current analyses. If Friend-1 confirmed a mutual friendship and participated in the study, Friend-1 was used in the current analyses. If Friend-1 denied a mutual relationship or did not participate and Friend-2 confirmed a mutual relationship and participated in the study, Friend-2 was used in the current analyses. Mean target age was 14.20 years old ($SD = 1.04$, range = 12-16), the mean age of Friend-1 was 14.25 years old ($SD = 1.30$, range = 11-18) and the mean age of Friend-2 was 14.27 years old ($SD = 1.45$, range = 11-20). The mean grade in school for the Target was 9th grade ($SD = 1.11$, range = 6-11), the mean grade for Friend-1 was 9th grade ($SD = 1.25$, range = 6-12) and the mean grade for Friend-2 was 9th grade ($SD = 1.29$, range = 5-12); two friends were not currently enrolled in school. Female friends (typically friends of female targets) were more likely to participate in the study (% female for Target = 52.6; for Friend-1 = 54.9; for Friend-2 = 52.0). Friends were more likely to be same-gender (94.4%) than cross-

gender (5.6%). Concordance rates were similar whether analyses included or excluded cross-gender friends; as such, all subsequent analyses included cross-gender friendships.

Statistically significant differences between targets who did versus did not participate at Wave 9 are presented in Table 2. Of 19 comparisons, 8 (42%) were statistically significant at $p < .05$. The effect sizes for statistically significant comparisons ranged from 0.30 to 0.56. Participants lost to follow-up at Wave 9 were more likely to: come from families with younger mothers ($d = .56$) with lower levels of maternal education ($d = 0.34$); have more positive views of alcohol use ($d = 0.36$); report less church attendance ($d = 0.39$) and have lower levels of religiosity ($d = 0.30$); report having friends with more positive views of alcohol use ($d = 0.34$); and have single (OR = 0.39), non-Caucasian (OR = 0.03) mothers.

Table 2. Participation biases: Target participation at Wave 1 and Wave 9; Friend participation at Wave 9

Variable	Target Participants ^a			Friend Participants ^b		
	W9 Dropout, M(SD) n=62	W9 Completer, M(SD) n=390	Test Statistic	No Friends Participating, M(SD) n=158	Friend(s) Participating, M(SD) n=232	Test Statistic
Target Age	9.06(1.01)	9.12(1.01)	$t_{(1,450)}^{\overline{=}} -0.37$	14.24(1.05)	14.10(1.03)	$t_{(1,388)}^{\overline{=}} 1.28$
Maternal Age	35.95(7.07)	39.47(5.37)	$t_{(1,450)}^{\overline{=}} -3.75^{***}$	43.39(5.69)	44.59(5.04)	$t_{(1,385)}^{\overline{=}} -2.17^*$
Maternal Education	3.58(1.43)	4.05(1.33)	$t_{(1,450)}^{\overline{=}} -2.57^{**}$	3.82(1.23)	4.22(1.38)	$t_{(1,388)}^{\overline{=}} -3.00^{**}$
Target Deviance ^c	1.21(0.28)	1.22(0.29)	$t_{(1,450)}^{\overline{=}} -0.23$	1.28(0.50)	1.22(0.35)	$t_{(1,388)}^{\overline{=}} 1.36$
Target Attitudes Towards Alcohol ^c	1.38(0.48)	1.23(0.37)	$t_{(1,450)}^{\overline{=}} 2.44^{**}$	1.81(0.84)	1.81(0.79)	$t_{(1,388)}^{\overline{=}} -0.06$
Target Alcohol Norms ^c	1.31(0.28)	1.26(0.31)	$t_{(1,450)}^{\overline{=}} 1.22$	1.82(0.73)	1.80(0.69)	$t_{(1,388)}^{\overline{=}} 0.32$
Target Church Attendance ^c	3.27(1.58)	3.90(1.57)	$t_{(1,450)}^{\overline{=}} -2.87^{**}$	3.15(1.74)	3.55(1.66)	$t_{(1,388)}^{\overline{=}} -2.33^*$
Target Religiosity ^c	2.36(0.52)	2.50(0.45)	$t_{(1,450)}^{\overline{=}} -2.27^*$	2.13(0.63)	2.25(0.58)	$t_{(1,388)}^{\overline{=}} -1.85$
Target Value on Achievement ^c	2.51(0.40)	2.51(0.37)	$t_{(1,450)}^{\overline{=}} -0.03$	2.30(0.39)	2.28(0.38)	$t_{(1,388)}^{\overline{=}} 0.47$
Target Attitude Towards Deviance ^c	1.22(0.32)	1.16(0.27)	$t_{(1,450)}^{\overline{=}} 1.26$	1.55(0.69)	1.52(0.59)	$t_{(1,388)}^{\overline{=}} 0.40$
Target Reports of Friends' Attitudes Towards Alcohol ^c	1.48(0.67)	1.29(0.45)	$t_{(1,450)}^{\overline{=}} 2.18^*$	1.94(0.88)	1.90(0.87)	$t_{(1,388)}^{\overline{=}} 0.46$
Target Reports of Friends' Attitudes Towards Drugs ^c	1.14(0.37)	1.14(0.36)	$t_{(1,426)}^{\overline{=}} 0.02$	1.51(0.74)	1.48(0.65)	$t_{(1,388)}^{\overline{=}} 0.46$
Target Reports of Friend 1 Deviant Behavior ^c	1.20(0.24)	1.14(0.22)	$t_{(1,380)}^{\overline{=}} 1.85$	1.42(2.26)	1.01(1.77)	$t_{(1,377)}^{\overline{=}} 1.88$
Target Reports of Friend 2 Deviant Behavior ^c	1.19(0.29)	1.14(0.24)	$t_{(1,273)}^{\overline{=}} 0.96$	1.18(2.22)	0.89(1.71)	$t_{(1,335)}^{\overline{=}} 1.24$
Target Gender	n (%)	n (%)	$\chi^2=0.77$	n (%)	n (%)	$\chi^2=0.40$
Male	26(41.9)	187(47.9)		78 (49.4)	107(46.1)	
Female	36(58.1)	203(52.1)		80(0.6)	125(53.9)	
Father-figure participating			$\chi^2=0.74$			$\chi^2=8.31^{**}$
No	15(24.2)	76(19.5)		46(29.7)	40(17.2)	
Yes	47(75.8)	314(80.5)		109(70.3)	192(82.8)	

Comparison	Target Participation Bias ^a		Test Statistic	Friend Participation Bias ^b		Test Statistic
	W9 Dropout, M(SD) <i>n</i> =56	W9 Completer, M(SD) <i>n</i> =396		No Friends Participating, M(SD) <i>n</i> =144	Friend(s) Participating, M(SD) <i>n</i> =252	
Maternal Ethnicity			$\chi^2=19.45^{***}$			$\chi^2=18.23^{***}$
Caucasian	32(51.6)	304(77.9)		106(67.1)	198(85.3)	
Non-Caucasian	30(48.4)	86(22.1)		52(32.9)	34(14.7)	
Maternal Marital Status			$\chi^2=11.72^{***}$			$\chi^2=23.20^{***}$
Married	33(53.2)	290(74.4)		90(58.1)	187(80.6)	
Single	29(46.8)	100(25.6)		65(41.9)	45(19.4)	
Maternal Employment			$\chi^2=0.49$			$\chi^2=8.62^{**}$
Full/Part Time	41(66.1)	275(70.5)		107(69.0)	190(81.9)	
Not Working	21(31.9)	115(29.5)		48(31.0)	42(18.1)	

^aVariables compared at Wave 1. ^bVariables compared at Wave 9. ^cAll items scored such that higher numbers represent increased risk for alcohol use.

* $p<0.05$. ** $p<0.01$. *** $p<0.001$.

Additionally, of those targets who participated at Wave 9, there were differences between those who did versus did not have friends participate. Of 19 comparisons, 7 (37%) were statistically significant at $p<.05$. The effect sizes for statistically significant comparisons ranged from 0.22 to 0.61. Participants who did not have friends participate at Wave 9 were more likely to: come from families with younger mothers ($d=0.22$) with lower levels of maternal education ($d= 0.31$); not have a father-figure participating in the study ($OR=2.03$); report less church attendance ($d=0.24$); and have single ($OR = 0.33$), non-Caucasian ($OR = 0.35$) mothers who are unemployed ($OR=0.49$).

2.4 MEASURES

Although a larger battery of measures was completed by the targets, measures of interest for the current study were completed by both the target and participating friends about themselves and about each other. Frequency distributions for the data are presented in Table 3.

Table 3. Variable Distributions

Measure	Target-Report of Friends			Friend Self-Report		
	Mean (SD)	N	%	Mean (SD)	N	%
Lifetime Drinking	0.2(0.4)			0.2(0.4)		
No		181	78		182	78.4
Yes		51	22		50	21.6
Lifetime Smoking	0.1(0.3)			0.1(0.3)		
No		209	90.1		202	87.1
Yes		23	9.9		30	12.9
Deviance (6 months)	1.1(1.9)			1.8(1.8)		
0		141	60.8		69	29.7
1		35	15.1		55	23.7
2		19	8.2		44	19.0
3		12	5.2		24	10.3
4		10	4.3		15	6.5
5		5	2.2		15	6.5
6		3	1.3		6	2.6
7		4	1.7		1	0.4
8		0	0		2	0.9
9		3	1.3		1	0.4

2.4.1 Cigarette and Alcohol Use.

Smoking behavior and alcohol consumption were assessed with two questions, worded in a manner that is typical for adolescent substance use assessment (e.g. NHSDUH; [Jessor and Jessor, 1977](#); [Office of Applied Studies, 2007](#)). Lifetime smoking behavior was assessed with the following question: “Have you ever tried smoking a cigarette (even just a puff)?” Response options were “No,” “Yes, Once,” “Yes, 2 or 3 times,” and “Yes, more than 2 or 3 times.” Following a statement that “drinks like beer, wine, and liquor contain alcohol,” lifetime alcohol use was assessed with the following question: “Have you ever had a drink of beer, wine, or liquor (not just a sip or a taste of someone else’s drink) in your life?” Response options ranged from “Never” to “More than 40 times.” Due to the skewness of the distributions, these variables were dichotomized for analysis (never used substance, has used substance). Two concordance variables, one for smoking and one for drinking, were created to reflect the agreement between friend self-report and target perception of friend behavior; agreement was coded as 1 and disagreement was coded as 0.

2.4.2 Deviant Behavior.

Deviant behavior was assessed with a 9-item modification of the General Deviant Behavior Scale ([Donovan et al., 1991](#)) assessing deviant behaviors (e.g. lying, cheating, stealing, and aggression) in the last 6 months. Response options for the friends ranged from 1=Never to 5=5 or more times. Sample questions are: “In the past six months how many times did you start a fist fight or a shoving match with a kid at school or in the neighborhood?” and “In the past six

months how many times did you lie to your parents about where you have been or who you were with?” The deviance variable was a count of behaviors in which the friend engaged, calculated separately for target perception and for friend self-report (0-9). Both target ($\alpha=0.81$) and friend ($\alpha=0.79$) reports on this scale had acceptable internal consistencies. A continuous concordance variable reflecting the agreement in reports was created by calculating the difference between target perceptions of friend behavior and friend self-reported behavior. Scores of 0 indicated agreement, negative scores indicated target under-report and positive scores indicated target over-report.

2.4.3 Relationship Quality.

The Network of Relationships Inventory ([Furman and Buhrmester, 1985](#); [Furman and Buhrmester, 1992](#)) permits children (2nd grade through college age) to rate each of a number of different social relationships on the same set of 10 three-item scales: Companionship, Conflict, Instrumental Aid, Antagonism, Intimacy, Nurturance, Affection, Admiration, Relative Power, and Reliable Alliance. Response options ranged from 1 to 5 where 1 was “little or none” and 5 was “the most” or “as much as possible.” The current study used the Intimacy subscale ($M=3.36$; $SD=1.25$; $\alpha=0.91$), and the Positive (Companionship and Intimacy subscales; $M=3.58$; $SD=1.00$; $\alpha=0.90$) and Negative (Conflict and Antagonism subscales; $M=1.61$; $SD=.65$; $\alpha=0.89$) composite scales to examine different aspects of relationship quality as predictors of reporting agreement; values were averaged and higher values indicated more positivity or negativity in the relationship, respectively. The positive relationship variable was negatively skewed with 65% of targets reporting scores greater than 3. In contrast, the negative relationship variable was positively skewed with 80% of

targets reporting scores of 1 or 2; therefore, the relationships in this study were characterized by high levels of intimacy and positivity and low levels of negativity.

Additionally, length of friendship was assessed by asking, “How many months have you been friends with X?” ($M=6.86$ years, $SD=3.99$ years). The median length of friendship in the sample was 6 years and 75% of friendships were longer than 3 years, indicating the sample was characterized by long and stable friendships. The amount of time targets spent with friends was assessed by asking, “Outside of school time, how much time do you spend doing things with your friends on weekdays (Monday through Thursday)?” and “How much time do you spend doing things with your friends on weekends (Friday after school through Sunday)?” Response options ranged from “I rarely spend time with friends” to “3 hours or more a day.” Because the last two items were significantly correlated ($r=0.44$), they were averaged to form one item indicating time spent with friends ($M=3.97$, $SD=0.96$). This variable was negatively skewed with 67% of targets reporting scores of 4 or more (spending 2 or more hours per day with friends outside of school). Because 17 participants endorsed a response option that did not directly quantify the amount of time spent with friends (“I only see friends outside of school at sports or other activities”), analyses with this variable had a sample size of 215.

2.4.4 Demographics.

Age and gender were provided by self-report (Male=1; Female=2).

2.5 ANALYTIC STRATEGY

2.5.1 Aim 1

Aim 1: Determine the degree of association between self-reported and friend-perceived substance use and deviant behavior by reciprocally endorsed friends in early adolescence.

Chi-square analyses were conducted to determine the concordance between target perceptions of friend substance use (smoking and drinking) and friend self-reports of lifetime substance use (smoking and drinking); these analyses were also repeated to determine the concordance between friend perceptions of target substance use (smoking and drinking) and target self-reports of lifetime substance use (smoking and drinking behavior). Pearson's r was used to calculate the degree of concordance between target perceptions of friend deviant behavior and the number of deviant behaviors self-reported by the friend in the last six months.

2.5.2 Aim 2

Aim 2: Examine quality of relationship (i.e. intimacy, positive and negative aspects of relationship quality, length of friendship, time spent with friends,) and demographic characteristics (i.e. age, gender) as potential predictors of the association between self-reported and friend-perceived substance use and deviant behaviors by reciprocally endorsed friends in early adolescence.

Logistic regression analyses were computed using SPSS v. 14 to determine if the proposed relationship and demographic variables were associated with concordance between

target perception and friend self-report of smoking and drinking. Logistic regression relates the predictor (e.g. target-report of intimacy) to the probability of a dichotomous outcome (e.g. smoking report concordance: yes or no; [Cohen et al., 2003](#)). With concordance of target perception and friend self-report of lifetime smoking as the outcome variable, each predictor (age, gender, intimacy, positive relationship quality, negative relationship quality, length of relationship and time spent with friends) was tested individually; target self-report of smoking behavior was tested as a predictor while controlling for target age and gender. An additional regression analysis included all predictor variables, with the exception of the intimacy subscale which was excluded because its items were part of the positive relationship composite variable. The analyses discussed above were also conducted with concordance of target perception and friend self-report of lifetime drinking as the outcome variable; in these analyses target self-report of drinking replaced target self-report of smoking as a predictor.

OLS regression analyses were used to determine if the proposed relationship and demographic variables were associated with concordance between target perception and friend self-report of deviant behavior. The same sets of predictors that were used to predict concordance in reports of smoking and drinking were also used to predict concordance in reports of deviance.

3.0 RESULTS

3.1 AIM 1

3.1.1 Concordance between target perception and friend self-report of lifetime smoking and drinking.

As shown in Table 4, target perceptions were significantly associated with friends' self-reports of smoking behavior. The statistically significant association was driven by the large number of reports that were in agreement about the absence of smoking. In contrast, there was little agreement about the presence of friend smoking behavior. When friends endorsed a lifetime history of smoking, target perception of friend smoking was not sensitive; target perceptions agreed with friend self-reports of smoking in only 36.7% of the cases where friends reported a positive lifetime history of smoking behavior. As shown in Table 5, the same pattern was present for the association between target perception and friend self-report of lifetime drinking behavior although targets were more sensitive in their perceptions of the presence of friend drinking behavior (60% target agreement with friend drinking endorsement).

Table 4. Concordance for Friend Smoking

Target-Report of Friend Smoking	Friend Self-Report of Smoking	
	No	Yes
No	190	19
Yes	12	11
$\chi^2 = 27.61, p < .001$		

Table 5. Concordance for Friend Drinking

Target-Report of Friend Drinking	Friend Self-Report of Drinking	
	No	Yes
No	161	20
Yes	21	30
$\chi^2 = 53.71, p < .001$		

To determine if there were differences in target perception of friend drinking depending on the level and severity of friend alcohol use, analyses were conducted to determine the concordance between target perception and friend self-reported quantity of drinking (0-6 drinks versus 7 or more drinks). Although this association was statistically significant ($\chi^2=18.601$, $p<0.001$), the pattern of findings was not appreciably different (182 dyads agreed on the absence of behavior; 5 dyads agreed on the presence of behavior; 45 targets under-reported friend drinking when compared with friend self-report; no targets over-reported friend drinking when compared with friend self-report), suggesting that target perception does not become more concordant with a wider range of possible scores.

3.1.2 Concordance between friend perception and target self-report of lifetime smoking and drinking.

In order to assess the generalizeability of the findings, concordance between friend-report of target behavior and target self-reported behavior was also examined for lifetime smoking and drinking. As shown in Table 6 and Table 7, results were similar to those for target perception and friend self-report of smoking and drinking in that there were statistically significant associations between reports provided by the friend and the target, but these associations were largely driven by agreement about the absence of problem behavior.

Table 6. Concordance for Target Smoking

Target Self-Report of Smoking	Friend Report of Target Smoking	
	No	Yes
No	192	7
Yes	21	12

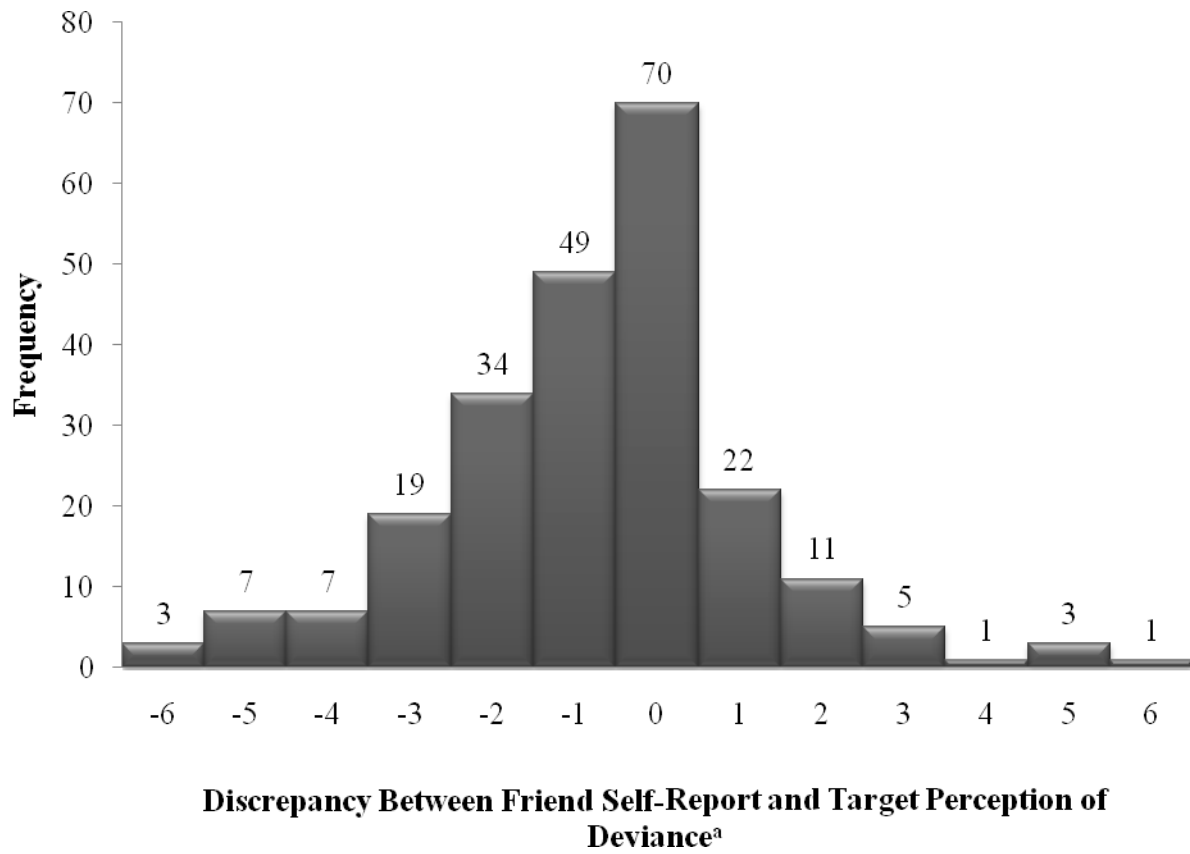
$$\chi^2 = 40.62, p < .001$$

Table 7. Concordance for Target Drinking

Target Self-Report of Drinking	Friend Report of Target Drinking	
	No	Yes
No	166	7
Yes	40	19
$\chi^2 = 53.05, p < .001$		

3.1.3 Concordance between target perception and friend self-report of number of deviant behaviors engaged in by the friend in the previous six months.

As seen in Figure 1, discrepancy scores were normally distributed and ranged from -6 to 6 ($M = 0.74$, $SD = 1.93$), with negative scores indicating target under-report ($n=119$), 0 indicating agreement between target perception and friend self-report ($n=70$), and positive scores indicating target over-report ($n=43$). Although most targets misperceived the extent of their friends' deviant behavior, target perception and friend self-report of deviant behavior were significantly correlated ($r=0.45$, $p<.001$).



^aScores less than 0 indicate target under-report, 0 indicates agreement between reporters, and scores greater than 0 indicate target over-report.

Figure 1. Distribution of discrepancy between friend self-report of deviant behavior and target perception of friend deviant behavior.

3.2 AIM 2

3.2.1 Predictors of concordance: smoking.

Based on logistic regression analyses, and as shown in Table 8, target age and target perceived relationship negativity were significant bivariate predictors of the concordance between target perceptions and friend self-reports of smoking behavior. Report concordance decreased for every one year increase in target age ($OR=0.62$) and for every one unit increase in target-reported relationship negativity ($OR=0.54$). Report concordance also decreased when targets endorsed a lifetime smoking history ($OR=0.33$) although this association was only marginally statistically significant. There were no bivariate relations between target gender, target-reported intimacy or positive relationship quality, length of friendship, or the amount of time spent with friends on target and friend report concordance.

Table 8. Regression results for bivariate predictor models with smoking, drinking, and deviance concordance as outcomes.

Predictor ^a	Smoking Concordance		Drinking Concordance		Deviance Concordance	
	Wald χ^2	<i>p</i>	Wald χ^2	<i>p</i>	β	<i>p</i>
Age	5.53	0.019*	5.18	0.023*	0.041	0.301
Gender ^b	0.79	0.375	1.97	0.160	- 0.013	0.846
Target Behavior	3.22	0.073†	0.66	0.417	0.246	0.000***
Intimacy	0.23	0.635	0.91	0.340	- 0.065	0.324
Positive Relationship Quality	0.06	0.809	0.93	0.336	- 0.061	0.353
Negative Relationship Quality	5.57	0.018*	0.10	0.757	0.025	0.700
Length of Friendship ^c	1.30	0.255	1.88	0.171	- 0.018	0.786
Time Spent with Friends ^d	0.00	0.996	4.219	0.040*	0.027	0.690

Note. Smoking and drinking concordance coded as 0=report disagreement, 1=report concordance; deviance concordance coded as such that negative values indicate under-report and positive values indicate over-report. Intimacy not included in the overall model because it was part of the positive relationship quality composite variable.

^aAll predictors are bivariate, except for target behavior which controls for target age and gender.

^bGender coded such that 1=male, 2=female. ^cLength of friendship in months. ^dHigher numbers indicate more time spent with friends (min=1; max=5).

† $p < 0.10$. * $p < 0.05$. ** $p < 0.01$. *** $p < 0.001$.

When all variables were entered into a final model ($\chi^2=93.85$), age was the only predictor that remained statistically significant ($p < 0.05$, OR=0.63), although negative relationship quality was marginally significant ($p=0.056$, OR=0.59). Although R^2 is used in OLS regression to evaluate the proportion of variance explained by the model, there is no universally accepted analog for logistic regression ([Agresti, 2002](#)). Therefore, using two estimates that approximate

the R^2 value (and will be used to do so for subsequent logistic regression analyses), this model accounted for 6.3 to 11.6 percent of the variance in report concordance.

For descriptive purposes, means and standard deviations of the predictor variables, separately for the concordant and non-concordant subgroups, are shown in Table 9. These data reveal the expected separation of means between the concordant and non-concordant subgroups for smoking, with effect sizes in the small to medium range. These data also show very little separation of the means for the remaining predictor variables, indicating that power to detect group differences did not underlie the absence of prediction for the remaining variables.

Table 9. Predictor variable characteristics (mean, standard deviation) based on outcome group membership.

Predictor	Smoking			Drinking			Deviance		
	Non-Concordant (n=31)	Concordant (n=201)	Effect Size	Non-Concordant (n=41)	Concordant (n=191)	Effect Size	Under-Report (n=119)	Concordant (n=70)	Over-Report (n=43)
Age	14.52(0.81)	14.04(1.04)	0.51*	14.44(0.93)	14.03(1.04)	0.42*	14.09(1.04)	14.01(1.04)	14.28(0.96)
Gender ^a	1.61(0.50)	1.53(0.50)	0.16	1.44(0.50)	1.56(0.50)	0.24	1.51(0.50)	1.63(.49)	1.47(.51)
Target Behavior	0.29(0.46)	0.12(0.33)	0.42*	1.29(0.46)	1.20(0.40)	0.21	1.19(1.67)	1.17(2.04)	2.67(2.33)
Intimacy	3.46(1.25)	3.35(1.25)	0.09	3.20(1.15)	3.40(1.27)	0.17	3.33(1.25)	3.44(1.15)	3.33(1.40)
Positive Relationship Quality	3.62(1.17)	3.57(1.00)	0.05	3.44(0.92)	3.61(1.01)	0.18	3.54(0.99)	3.59(0.99)	3.66(1.02)
Negative Relationship Quality	1.87(0.86)	1.56(0.61)	0.42*	1.63(0.75)	1.60(0.63)	0.04	1.65(0.65)	1.44(0.54)	1.76(0.76)
Length of Friendship ^b	91.45(46.63)	80.90(48.04)	0.22	91.63(46.59)	80.31(48.05)	0.24	82.38(48.60)	84.51(46.63)	78.53(48.85)
Time Spent with Friends ^c	3.97(1.00)	3.97(0.96)	0.00	4.26(0.73)	3.90(1.00)	0.41*	3.97(0.88)	3.85(1.11)	4.16(0.91)

^aGender coded such that 1=male, 2=female. ^bLength of friendship in months. ^cHigher numbers indicate more time spent with friends (min=1; max=5).

*Variable was a significant bivariate predictor in regression analysis.

3.2.2 Predictors of concordance: drinking.

Based on logistic regression analyses, and as shown in Table 8, target age and the amount of time friends spent together were significant bivariate predictors of the concordance between target perceptions and friend self-reports of drinking behavior. Report concordance decreased for every one year increase in target age ($OR=0.67$) and for every one unit increase in the amount of time spent with friends ($OR=0.62$). There was no individual effect of target gender, target drinking, target-reported intimacy, positive or negative relationship quality, or length of friendship, on target and friend report concordance. When all variables were entered into a final model, time spent with friends ($p=0.06$, $OR=0.64$) was marginally significant; this model ($\chi^2=11.53$, $p = 0.12$) accounted for 5.2 to 8.6 percent of the variance in report concordance.

3.2.3 Predictors of concordance: deviance.

OLS regression was used to examine the discrepancy between target perception and friend self-reported frequency of deviant behavior. As shown in Table 8, only one predictor variable was statistically significantly associated with concordance of reports of deviance. Increases in target's own deviant behavior were related to target over-report of friend deviant behavior; this model accounted for 6% of the variance in the discrepancy score. This association remained after controlling for target age and gender.

To aid in the interpretation of results that used a continuous discrepancy score as the outcome (where both high and low ends of the variable scale indicated disagreement), additional analyses were conducted with the absolute value of the discrepancy score (0= agreement

between target and friend, >0 = disagreement between target and friend) as the dependent variable. No predictors were statistically significant using this re-coded variable. This finding, consistent with the means reported in Table 9, indicates that target deviance was only associated with target over- (and not under-) report of friend deviance.

4.0 DISCUSSION

The current study was the first to directly examine concordance between reciprocally endorsed friends' perceptions of one another's substance use and deviant behavior in early adolescence. Initiation of cigarette smoking and alcohol consumption at this age (13-15 years old in the current study), typically a socially-mediated phenomenon, is a well-established marker of vulnerability to later substance abuse problems. Perceived use among friends is believed to be an important precipitant to onset and maintenance of substance use among teens. In the present study, significant relations were found between target perceptions and friend self-reports of both smoking and drinking, but targets were not sensitive in their perceptions of their friends' positive history of substance use. Target perceptions of deviance (behaviors that often precede or co-occur with early substance use) were also significantly correlated with friend self-report of deviance, although this correlation was unimpressive in magnitude. Analyses examining predictors of report concordance between targets and friends found relatively few statistically significant associations. Older participants were less concordant for reports of smoking and drinking, and more self-reported smoking and deviance predicted decreased report concordance for those same behaviors. Finally, two aspects of relationship quality were related to report concordance: negative relationship quality and less time spent with friends. High levels of negativity in the friendship dyad were related to lower rates of concordance for smoking; the

more time targets spent with friends, the less concordant their reports were for friend drinking. Overall, only a small number of hypothesized predictions were confirmed.

4.1 CONCORDANCE BETWEEN ADOLESCENT PERCEPTION AND FRIEND SELF-REPORT OF PROBLEM BEHAVIOR.

As reflected by significant χ^2 values, adolescents and their friends generally provided concordant reports of one another's smoking and drinking behaviors. However, most agreements concerned the absence of smoking or drinking behavior. For example, 81.9% of the targets and friends agreed that the friend had never smoked a cigarette, and 69.4% of the targets and friends agreed that the friend never drank a full drink of alcohol. The relatively low levels of substance use reported, which are normative for this age range (NHSDUH, [Office of Applied Studies, 2007](#)), may have contributed to the low levels of agreement about positive endorsements of smoking and drinking behavior by either party. For example, adolescents perceived only 36.7% of friend self-reported lifetime smoking but only 30 friends reported smoking behavior. Report concordance of drinking *frequency* (7 or more drinks in the previous six months) was also low which may have also been affected by the infrequency of this behavior. However, the poor concordance for this clinically concerning and potentially more observable behavior suggests that young adolescents may be quite unaware of serious substance involvement by good friends.

Because perceptions of friend behavior are a strong determinant of adolescent drinking behavior ([Bauman and Fisher, 1986](#); [Iannotti et al., 1996](#)), the lack of sensitivity and the under-reporting of smoking and drinking found in the current study, for this young age range, is intriguing. Assuming that the youth in the study are reporting what they truly know, these

findings suggest that interpretations of peer perception findings at this young age should be made cautiously. Researchers should avoid assuming that youth are truly aware of their friends' involvement in substance use and other deviant behaviors. However, some degree of measurement inaccuracy may also be contributing to the low concordance. Although measures were in place to ensure privacy, it is possible that adolescents may not want to report about their friends' substance use for fear of negative repercussions; adolescent culture may also reward individuals who protect their friends' behaviors as private. If these conditions were true, errors of under-reporting, due to fear of parent reaction, would be expected instead of errors of over-reporting. Both types of errors were found, suggesting that different processes may be contributing to poor concordance. The errors of under-reporting do support interesting speculation about whether lack of knowledge about friend substance use might ultimately have a protective effect in its potential to reduce early target smoking and drinking. Longitudinal follow-up of these inaccurate reporters will ultimately be fruitful to determine whether such perceptions are beneficial or detrimental in the long-run.

Concordance between target perception and friend self-report of deviance was statistically significant but modest in magnitude, as indicated by a correlation between reporters of .45. Only 70 out of 232 target reports (30%) were perfectly concordant with friend self-report (i.e. there was no difference between the number of deviant behaviors perceived by the target and self-reported by the friend). Most targets (119/232 or 51%) under-reported their friend's engagement in deviant behaviors such as starting fights or lying to parents. Some, but not all, of the statistical comparisons between retained and non-retained participants, and between targets with and without participating friends, suggested possible under-representation of youth who are

vulnerable to problem behaviors. Greater representation of these youth might have improved prediction of concordance for all outcome variables.

Although reports of problem behavior were often discordant for smoking, drinking, and deviance, there are several differences in the prevalence and development of deviant behavior, compared to smoking and drinking behaviors, which could have affected the likelihood that adolescents would more readily perceive friend deviance. First, in contrast to smoking and alcohol use which were uncommon (12.9% and 21.6%, respectively) and reflected lifetime behavior, targets may have had a greater opportunity to provide concordant reports for deviance because 70.3% of friends endorsed engaging in at least one deviant behavior in the last six months. Second, in contrast to smoking and drinking for which adolescents were provided only two questions (one for each behavior), the greater endorsement of deviance may have been influenced by the opportunity to endorse any of nine behaviors that may be normative and observable (e.g. push or shove another kid) during adolescence ([Hinshaw and Lee, 2003](#); [Moffitt, 1993](#)). Third, deviant behavior occurs developmentally prior to the onset of smoking and drinking which may explain its greater prevalence ([Boyle et al., 1993](#); [Kellam et al., 1982](#); [Lynskey and Fergusson, 1995](#)). Fourth, observation of friend deviance may be easier than observation (or knowledge) of friend substance use. Smoking and drinking often develop in circumscribed peer groups which may make observing these behaviors difficult if the target is outside the peer group in which the problem behavior is occurring ([Ennett and Bauman, 1994](#); [Urberg et al., 1997](#)). Our results for deviance, however, suggest that although problem behaviors of the type measured in this study are common in this age range, individual friends may not perceive these behaviors. Thus, it is possible that friendship selection and communication within adolescent dyads may not always reflect openness about all behavior. As with smoking and

drinking, an important future direction for research will be to examine whether low levels of awareness of adolescent friend problem behavior may serve as a protective factor for individuals who are at risk for problem behaviors because of their affiliation with deviant friends.

Many studies of the peer environment and its effects on adolescent behavior rely on adolescent perceptions of friend behavior. The findings of the current study, that such perceptions may be inaccurate, suggests caution when interpreting these effects. The distinction between actual peer behavior and perceptions of peer behavior needs to be retained when considering peer socialization influences. Because perceptions of friend problem behavior significantly predict adolescent problem behavior, assessing perceptions can yield important information and should not be abandoned. For example, although an adolescent may be unaware of friend problem behavior, he/she may still perceive, and be influenced by, a friend's risk factors for problem behavior, such as behavioral disinhibition (risk-taking and/or poor judgment) and difficulty in school (modeling detachment from conventional social goals). Additionally, friends may have attitudes and beliefs that support problem behavior that may be expressed in the context of a close friendship; perceived approval of problem behavior may influence adolescent problem behaviors such as drinking ([Jessor and Jessor, 1975](#)). Therefore, although perception of friend problem behavior may influence adolescent problem behavior, other friend characteristics may also directly or indirectly contribute and should be considered in future studies of the friend socialization process.

4.2 PREDICTORS OF CONCORDANCE: DEMOGRAPHIC AND RELATIONSHIP QUALITY VARIABLES

Analyses conducted to determine if there were characteristics of the sample that predicted report concordance found few statistically significant predictors. Across eight predictors, only age, target behavior, relationship negativity and the amount of time spent with friends were associated with report concordance for smoking, drinking, and deviance. Further, when there were significant associations, the magnitude of effect was small for all predictors, as evidenced by the small pseudo- R^2 estimates, ranging from 5.2% to 11.6%. Finally, additional analyses of the frequency of drinking and the discordance of deviance reports, which aimed to improve the power of prediction, did not do so. Therefore, there were few predictors that were associated with report concordance of problem behavior, and none of these accounted for a large amount of the variance in report concordance.

Within this sample's age range (13-15), older adolescents' perceptions of their friends' substance use were less concordant with friend self-reports of both smoking and drinking. This was a surprising finding because experimentation with alcohol and tobacco increases with age and tends to be socially mediated. Thus, greater, not less, concordance was expected for older children. The unexpected findings may be due to the observed increase in the size and quantity of social networks as children progress through secondary school ([Brown et al., 1986](#)). Observation of friends' behaviors (even close friends) may become increasingly difficult with age, particularly if the friend engages in problem behaviors in a non-overlapping peer group ([Ennett and Bauman, 1994](#)). There appear to be no direct observational data on the pervasiveness of substance use throughout an adolescent's multiple social networks. Such data,

if available, would help to clarify why perceptions might be inaccurate if adolescents “try on” different social roles as they gravitate from one social setting to another.

The target child’s self-reported engagement in smoking and in deviance were significant predictors of report concordance for both of these behaviors. Although marginally significant, when the target reported a lifetime history of smoking, his/her report about the friend’s smoking was more likely to be discordant with friend self-report. Unfortunately the small number of children reporting smoking made it impossible to distinguish errors of under- from errors of over-reporting in the regression analyses. In contrast, targets who reported engaging in deviant behavior were more likely to over-report their friend’s deviance. This finding is consistent with the results from Bauman & Koch ([1983](#)) which found that in adolescence problem behavior is likely to be projected onto friends. This projection is significant because adolescents who have social and cognitive deficits that may bias their perceptions of their friends’ behaviors are also the most likely to have subsequent substance use problems ([Sher, 1991](#)). Therefore, the most vulnerable adolescents may have an escalated trajectory of problem behavior due to misperceived friend influence which compounds existing risk factors such as early problem behavior and social and cognitive deficits.

Another predictor of report concordance was the amount of negativity in the friend dyad as perceived by the target. Even with low rates of negativity in the sample, as negative relationship quality increased, report concordance for smoking behavior decreased; there was no effect of negative relationship quality on report concordance for drinking or deviance. In this age group, smoking is less often endorsed than alcohol initiation ([Office of Applied Studies, 2007](#)) and general deviant behavior. Researchers ([Patterson, 1986](#); [Sher, 1991](#)) have shown that adolescents who are at risk for engaging in problem behaviors have a profile of social, academic

and cognitive impairments, which may include friendships that are characterized by negativity. Therefore, the adolescents in the current sample who are engaging in the most deviant behavior for this age range (smoking) may have a profile characteristic of adolescents at risk for problem behaviors, which includes negative relationship quality. This is further supported by the finding that relationship positivity was not a significant predictor of report concordance for any of the dependent variables; it is possible that there was a ceiling effect of positivity in the current sample due to the strong, stable and reciprocal friendships. Future studies should assess other variables related to social, cognitive and academic functioning in a sample with more variability in the level of positive relationship quality in order to determine the strongest predictors, and possible profiles, of report concordance for problem behavior in adolescence.

The amount of time spent with friends was a significant predictor of report concordance for alcohol use but the relation was opposite than predicted: more time spent with friends was related to less report concordance. This surprising result may be a function of the context within which friend socializing occurs. The majority of adolescents in this sample endorsed spending at least two hours a day with friends outside of school. Unfortunately, however, the context of these interactions was not measured. Socializing may have occurred in organized sports or community social functions where problem behaviors are unlikely to occur, or it may have occurred in unsupervised contexts that provide greater opportunities for engagement in and exposure to problem behaviors. Therefore, the relation between time spent with friends and report concordance may be moderated by the environment in which adolescents spend their time. Additionally, the wording of the question was general, "...how much time do you spend doing things with your friends..." and did not specifically ask how much time was spent with the friend participating in the study. Therefore, spending less time with friends, in general, may be

symptomatic of other risk factors and could further contribute to a profile of risk for problem behaviors.

Although there were several significant predictors of report concordance, other variables (gender, intimacy, positive relationship quality and length of friendship) did not predict whether adolescent perceptions of friend problem behavior were concordant with friend self-report of problem behavior. Due to the infrequent occurrence of smoking and drinking in this age group, it may be difficult to capture meaningful predictors of report concordance. In spite of this difficulty, future studies should consider additional predictors that were not within the scope of the current study. For example, the context of friend socialization and characteristics of the adolescent that may facilitate accurate perceptions (e.g. inattention, social anxiety, cognitive deficits) may be associated with report concordance. Beyond the infrequent smoking and drinking behavior in the current sample, it is also possible that the structure of the dependent variables limited the ability to identify predictors. For example, the criterion for agreement between reports of deviant behavior was stringent: targets and friends needed to endorse the same number of deviant behaviors in the last month. Therefore, if a target was unaware that their friend had lied to a parent at least once in the last six months, then target perceptions and friend self-reports were discordant, with the target under-reporting friend deviance compared to friend self-report. While only 30% of dyads had perfect agreement, 61% of the reports were concordant within one point on a nine-point scale. Therefore, there was some agreement in the current sample and a less stringent criterion for agreement may provide more clinically-relevant information about report concordance. Additionally, unlike the current study, future research with older children may be better suited to identify predictors of report concordance of established adolescent problem behavior, which was beyond the scope of the current study which

only examined alcohol socialization at the early ages when initiation occurs. In sum, although target age, target behavior, negative relationship quality and the amount of time spent with friends were all significant predictors of report concordance of adolescent problem behavior, the exploration of other predictors is indicated. Future studies with additional predictors, less stringent criteria for agreement, and an older age group may be better suited to identify which factors are associated with concordant reports of adolescent problem behavior.

4.3 GENERAL DISCUSSION

The low rates of concordance for all types of problem behavior that were found in these analyses are somewhat surprising considering the characteristics of the current sample. First, dyads in this sample are comprised of reciprocally endorsed friends with relationships characterized by high levels of stability and positivity. Although having a mutually-nominated best friend is common in adolescence ([Parker and Asher, 1993](#)), between the ages of 10 and 14, friendships become more exclusive, causing friendships from early childhood to dissolve ([Berndt and Hoyle, 1985](#)). Additionally, children's entrance to puberty leads to varying stages of development and rapid shifts in interest which result in changes in friendships ([Berndt and Hoyle, 1985](#)). Therefore, the stability found in the relationships in the current study appears to be atypical of adolescent friendships. In contrast, there were high levels of intimacy in the current sample, a typical feature of adolescent friendships that discriminates adolescent friendships from non-friendships ([Newcomb and Bagwell, 1995](#)). Because of the high levels of sharing and awareness of one another's behaviors due to the high levels of intimacy, one could expect increased report concordance; however this was not true. Although there are many venues and opportunities for

adolescents to share personal information, because of a social desirability bias, adolescents may conceal their problem behaviors which are still uncommon at this age. Finally, adolescents with the most problematic behaviors and the least typical friendships may not be reflected among those choosing to participate in a research study.

Although this study had the methodological strength of collecting reports directly from the target and the friend, there were limitations to the methodology. First, because of the infrequent endorsements of alcohol use and cigarette smoking, we were unable to examine aspects of substance use beyond lifetime history, such as report concordance for frequency or quantity of recent use. Additionally, this study was only able to examine report concordance, but not report accuracy; although measures were taken to ensure report validity, it is likely that friend self-reports were not entirely veridical. Future research using objective measures (e.g. carbon dioxide levels) would provide information as to whether adolescents are truly accurate in their perceptions of friend problem behavior.

In spite of these limitations, there are important methodological strengths of the current study. Many research studies ask adolescents to report their perceptions of their friends' problem behavior as a proxy for direct measurement. This technique provides valuable information regarding adolescent perceptions, however the current results suggest that it is probably not a valid method for collecting accurate information about friend behavior (particularly when it is present) in early adolescence. Therefore, studies that rely on reports about friends should be wary about extending their interpretations of findings beyond discussion of perceptions of the friend environment. There may be utility in collecting both collateral reports provided by an adolescent about their friend's behavior and friend self-report of behavior separately. Research needs to

investigate whether friend influences are associated with adolescent problem behavior when different reporting paradigms are used.

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